USDA Natural Resources
Conservation Service

Ecological site R025XY076NV
SHALLOW LOAM 16+ P.Z.

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 025X–Owyhee High Plateau

MLRA Notes 25—Owyhee High Plateau
This area is in Nevada (56 percent), Idaho (30 percent), Oregon (12 percent), and Utah (2 percent). It makes up about 27,443 square miles. MLRA 25 is characteristically cooler and wetter than the neighboring MLRAs of the Great Basin. The western boundary is marked by a gradual transition to the lower and warmer basins of MLRA 24. The boundary to the south-southeast, with MLRA 28B, is marked by gradual changes in geology marked by an increased dominance of singleleaf pinyon and Utah juniper and a reduced presence of Idaho fescue. The boundary to the north, with MLRA 11, is a rapid transition from the lava plateau topography to the lower elevation Snake River Plain.
Physiography:
All of this area lies within the Intermontane Plateaus. The southern half is in the Great Basin section of the Basin and Range province. This part of the MLRA is characterized by isolated, uplifted fault-block mountain ranges separated by narrow, aggraded desert plains. This geologically older terrain has been dissected by numerous streams draining to the Humboldt River.
The northern half of the area lies within the Columbia Plateaus province. This part of the MLRA forms the southern boundary of the extensive Columbia Plateau basalt flows. Most of the northern half is in the Payette section, but the northeast corner is in the Snake River Plain section. Deep, narrow canyons draining into the Snake River have been incised into this broad basalt plain. Elevation ranges from 3,000 to 7,550 feet on rolling plateaus and in gently sloping basins. It is more than 9,840 feet on some steep mountains. The Humboldt River crosses the southern half of this area
Geology:
The dominant rock types in this MLRA are volcanic. They include andesite, basalt, tuff, and rhyolite. In the north and west parts of the area, Cretaceous granitic rocks are exposed among Miocene volcanic rocks in mountains. A Mesozoic igneous and metamorphic rock complex dominates the south and east parts of the area. Upper and Lower Paleozoic calcareous sediments, including oceanic deposits, are exposed with limited extent in the mountains. Alluvial fan and basin fill sediments occur in the valleys.
Climate:
The average annual precipitation in most of this area is typically 11 to 22 inches. It increases to as much as 49 inches at the higher elevations. Rainfall occurs in spring and sporadically in summer. Precipitation occurs mainly as snow in winter. The precipitation is distributed fairly evenly throughout fall, winter, and spring. The amount of precipitation is lowest from midsummer to early autumn. The average annual temperature is 33 to 51 degrees F. The freeze-free period averages 130 days and ranges from 65 to 190 days, decreasing in length with elevation. It is typically less than 70 days in the mountains.
Water:
The supply of water from precipitation and streamflow is small and unreliable, except along the Owyhee, Bruneau, and Humboldt Rivers. Streamflow depends largely on accumulated snow in the mountains. Surface water from mountain runoff is generally of excellent quality and suitable for all uses. The basin fill sediments in the narrow alluvial valleys between the mountain ranges provide some ground water for irrigation. The alluvial deposits along the large streams have the most ground water. Based on measurements of water quality in similar deposits in

adjacent areas, the basin fill deposits probably contain moderately hard water. The water is suitable for almost all uses. The carbonate rocks in this area are considered aquifers, but they are little used. Springs are common along the edges of the limestone outcrops.
Soils:
The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic or frigid temperature regime and an aridic, aridic bordering on xeric, or xeric moisture regime. Soils with aquic moisture regimes are limited to drainage or spring areas, where moisture originates or runs on and through. These soils are of a very limited extent throughout the MLRA. They generally are well drained, clayey or loamy, and shallow or moderately deep. Most of the soils formed in mixed parent material. Volcanic ash and loess mantle the landscape. Surface soil textures are loam and silt loam with ashy texture modifiers in some areas. Argillic horizons occur on the more stable landforms. They are exposed nearer the soil surface on convex landforms, where ash and loess deposits are more likely to erode. Soils that formed in carbonatic parent material in areas that receive less than 12 inches of precipitation are characterized by calcic horizons throughout the profile, while soils in areas that receive more than 12 inches of precipitation do not have calcic horizons in the upper part of the profile. Soils that formed on stable landforms at the lower elevations are dominated by ochric horizons. Soils that formed at the middle and upper elevations are characterized by mollic epipedons. Soils in drainage areas at all elevations that receive moisture running on or through them are characterized by thicker mollic epipedons.
Biological Resources:
This MLRA supports shrub-grass vegetation. Lower elevations are characterized by Wyoming big sagebrush associated with bluebunch wheatgrass, western wheatgrass, and Thurber’s needlegrass. Other important plants include bluegrass, squirreltail, penstemon, phlox, milkvetch, lupine, Indian paintbrush, aster, and rabbitbrush. Black sagebrush occurs but is less extensive. Singleleaf pinyon and Utah juniper occur in limited areas. With increasing elevation and precipitation, vast areas characterized by mountain big sagebrush or low sagebrush/early sagebrush in association with Idaho fescue, bluebunch wheatgrass, needlegrasses, and bluegrass become common. Snowberry, curl-leaf mountain mahogany, ceanothus, and juniper also occur. Mountains at the highest elevations support whitebark pine, Douglas-fir, limber pine, Engelmann spruce, subalpine fir, aspen, and curl-leaf mountain mahogany.
Major wildlife species include mule deer, bighorn sheep, pronghorn, mountain lion, coyote, bobcat, badger, river otter, mink, weasel, golden eagle, red-tailed hawk, ferruginous hawk, Swainson’s hawk, northern harrier, prairie falcon, kestrel, great horned owl, short-eared owl, long-eared owl, burrowing owl, pheasant, sage grouse, chukar, gray partridge, and California quail. Reptiles and amphibians include western racer, gopher snake, western rattlesnake, side-blotched lizard, western toad, and spotted frog. Fish species include bull, red band, and rainbow trout.

Ecological site concept

This site occurs on steep mountain sideslopes on all aspects. Slopes range from 30 to 75 percent. Elevations range from 8,000 to 9,700 feet.

The soils associated with this site are moderately deep over bedrock and well drained. The soils are formed in residuum derived from granitic rocks. The soils have 35 to 75 percent coarse fragments throughout the profile. They have a high amount of gravels, cobbles and stones on the surface which occupy plant growing space yet provide a stabilizing affect on surface erosion conditions.

The reference plant community is dominated by spike-fescue, sedges, and mountain big sagebrush. Potential vegetative composition is about 55% grasses, 10% forbs and 35% shrubs. Approximate ground cover (basal and crown) is 45 to 55 percent.

Associated sites

F025XY065NV	**Backslope Aspen**
R025XY004NV	**LOAMY SLOPE 16+ P.Z.**
R025XY016NV	**SOUTH SLOPE 14-18 P.Z.**
R025XY024NV	**MOUNTAIN RIDGE**
R025XY052NV	**CEANOTHUS THICKET**

Similar sites

R025XY042NV	**SHALLOW LOAM 14-16 P.Z.** PSSPS-FEID codominant grasses; PUTR2 important shrub
R025XY016NV	**SOUTH SLOPE 14-18 P.Z.** More productive site; LECI4-BRMA4-PSSPS codominant grasses
R025XY004NV	**LOAMY SLOPE 16+ P.Z.** More productive site
R025XY056NV	**LOAMY 14-16 P.Z.** More productive site; FEID dominant grass

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata subsp. vaseyana*
Herbaceous	(1) *Leucopoa kingii*

Physiographic features

This site occurs on steep mountain sideslopes on all aspects. Slopes range from 30 to 75 percent. Elevations are 8000 to 9700 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	2,438–2,957 m
Slope	30–75%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid, characterized by cold, moist winters and warm, dry summers. The average annual precipitation ranges from 14 or more inches. Mean annual air temperature is typically <45 degrees F. The average growing season is about 50 to 70 days.

Mean annual precipitation across the range in which this ES occurs is 18.58".

Monthly mean precipitation: January 1.65”; February 1.68”; March 1.98”; April 2.43”; May 2.41”; June 1.62”; July 0.61”; August 0.63”; September 0.84”; October 1.41”; November 1.51”; December 1.79”.

*The above data is averaged from the Jarbridge 4N and Lamoille PH WRCC climate stations.
Frost free days (>32): 83.5
Freeze free days (>28): 114

Table 3. Representative climatic features

Frost-free period (average)	84 days
Freeze-free period (average)	114 days
Precipitation total (average)	483 mm

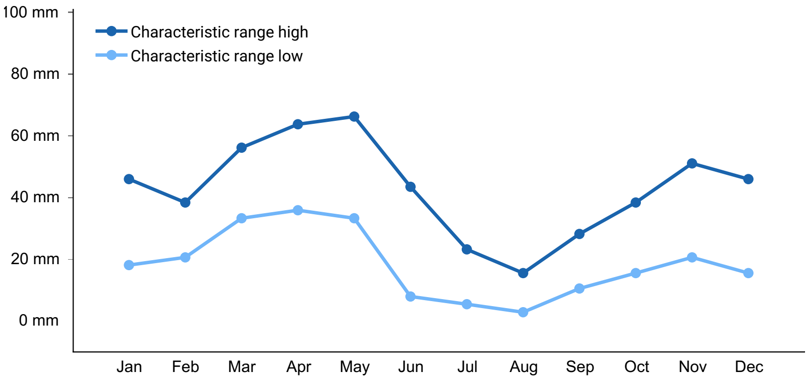

Figure 1. Monthly precipitation range

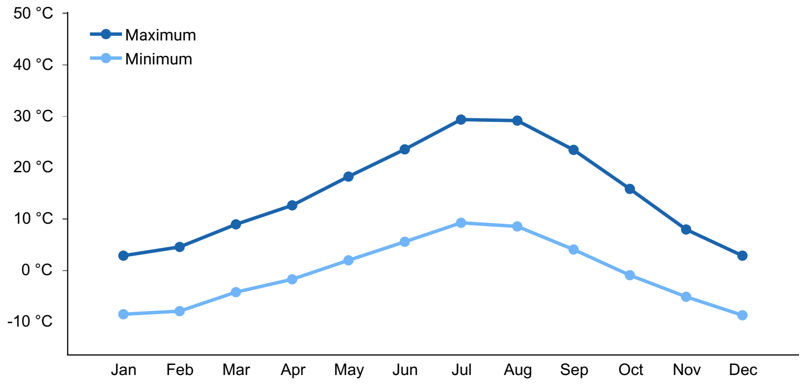

Figure 2. Monthly average minimum and maximum temperature

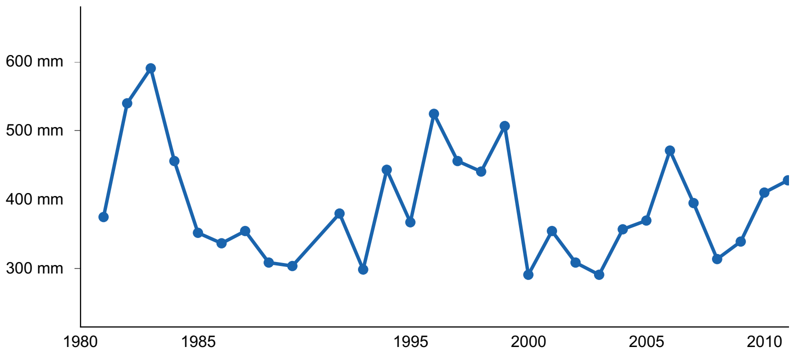

Figure 3. Annual precipitation pattern

Climate stations used

- (1) JARBIDGE 7 N [USC00264039], Jackpot, NV
- (2) LAMOILLE YOST [USC00264394], Spring Creek, NV

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are moderately deep over bedrock and well drained. The soils are formed in residuum derived from granitic rocks. The soils have 35 to 75 percent coarse fragments throughout the profile. They have a high amount of gravels, cobbles and stones on the surface which occupy plant growing space yet provide a stabilizing affect on surface erosion conditions. The available water capacity of these soils is very low and runoff is high. Potential for sheet and rill erosion is slight to moderate depending on slope.

The soil series correlated with this site include: Aycab.

Table 4. Representative soil features

Parent material	(1) Colluvium (2) Residuum (3) Loess
Surface texture	(1) Very cobbly loam (2) Very bouldery loamy coarse sand (3) Gravelly very fine sandy loam
Family particle size	(1) Loamy-skeletal (2) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	61–102 cm
Soil depth	61–102 cm
Surface fragment cover <=3"	2–20%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.83–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	18–19%
Subsurface fragment volume >3" (Depth not specified)	0–11%

Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and it has a set of key characteristics that influence a site's resilience to disturbance and resistance to invasives. Key characteristics include 1) climate (precipitation, temperature), 2) topography (aspect, slope, elevation, and landform), 3) hydrology (infiltration, runoff), 4) soils (depth, texture, structure, organic matter), 5) plant communities (functional groups, productivity), and 6) natural disturbance regime (fire, herbivory, etc.) (Caudle et al. 2013). Biotic factors that that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

This ecological site is dominated by deep-rooted cool season, perennial bunchgrasses and long-lived shrubs (50+ years) with high root to shoot ratios. The dominant shrubs usually root to the full depth of the winter-spring soil moisture recharge, which ranges from 1.0 to over 3.0 m (Dobrowolski et al. 1990). Root length of mature sagebrush plants was measured to a depth of 2 meters in alluvial soils in Utah (Richards and Caldwell 1987). These shrubs have a flexible generalized root system with development of both deep taproots and laterals near the surface (Comstock and Ehleringer 1992).

The perennial bunchgrasses that are co-dominant with the shrubs include mountain brome, slender wheatgrass, Idaho fescue, spike fescue and grass like plants such as sedges. These species generally have somewhat shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 m of the soil profile. The root systems of short lived perennial grasses such as Sandberg bluegrass and mountain brome penetrate only the upper 40cm of the soil, whereas longer lived perennial bunchgrasses can reach depths up to 160 cm (Spence 1937). General differences in root depth distributions between grasses and shrubs results in resource partitioning in these shrub/grass systems.

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity has increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability within the soil profile (Bates et al. 2006).

The Great Basin sagebrush communities have high spatial and temporal variability in precipitation both among years and within growing seasons. Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition or can increase resource pools by the decomposition of dead plant material following disturbance. The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007).

Singleleaf pinyon (*Pinus monophylla*) may occur where these sites are adjacent to woodlands. An extended fire return interval and/or inappropriate grazing can facilitate pinyon invasion. Eventually, singleleaf pinyon will dominate the site and out-compete sagebrush for water and sunlight severely reducing both the shrub and herbaceous understory (Lett and Knapp 2005, Miller and Tausch 2000). Bluegrasses may remain underneath trees on north-facing slopes.

As ecological condition declines, spike-fescue and other palatable grasses and forbs decrease, while mountain big sagebrush, rabbitbrush and snowberry increase.

This ecological site has moderate to high resilience to disturbance and resistance to invasion. Increased resilience increases with elevation, aspect, increased precipitation and increased nutrient availability.

Fire Ecology:
Fire is believed to be the dominant disturbance force in natural big sagebrush communities. Several authors suggest pre-settlement fire return intervals in mountain big sagebrush communities varied from 15 to 25 years (Burkhardt and Tisdale 1969, Houston 1973, and Miller et al. 2000). Kitchen and McArthur (2007) suggest a mean fire return interval of 40 to 80 years for mountain big sagebrush communities, though 15 to 80 years is most likely more accurate and reflects the differences in elevation and precipitation where mountain big sagebrush communities occur. On a landscape scale, multiple seral stages were represented in a mosaic reflecting periodic reoccurrence of fire and other disturbances (Crawford et al 2004). Post-fire hydrologic recovery and resilience is primarily influenced by pre-fire site conditions, fire severity, and post-fire weather and land use that relate to vegetation recovery. Fire adaptation by herbaceous species is generally superior to the dominant shrubs, which are typically killed by fire. Sites with low abundances of native perennial grasses and forbs typically have reduced resiliency following disturbance and are less resistant to invasion or increases in cheatgrass (Miller et al 2013).

Mountain big sagebrush is killed by fire (Neuenschwander 1980, Blaisdell et al. 1982), and does not resprout (Blaisdell 1953). Post fire regeneration occurs from seed and will vary depending on site characteristics, seed source, and fire characteristics. Mountain big sagebrush seedlings can grow rapidly and may reach reproductive maturity within 3 to 5 years (Bunting et al. 1987). Mountain big sagebrush may return to pre-burn density and cover within 15 to 20 years following fire, but establishment after severe fires may proceed more slowly and can take up to 50 years (Bunting et al. 1987, Ziegenhagen 2003, Miller and Heyerdahl 2008, Ziegenhagen and Miller 2009).

Mountain snowberry is top-killed by fire, but resprouts after fire from rhizomes (Leege and Hickey 1971, Noste and Bushey 1987). Snowberry has been noted to regenerate well and exceed pre-burn biomass in the third season after fire (Merrill et al. 1982). Utah serviceberry sprouts after fire (Conrad 1987) and grows more rapidly than some other serviceberry species (Plummer et al. 1968). Black chokecherry sprouts from rhizomes after fire and may form dense thickets (Plummer et al. 1968). If balsamroot or mules ear is common before fire, these plants will increase after fire or with heavy grazing (Wright 1985).

The effect of fire on bunchgrasses relates to culm density, culm-leaf morphology, and the size of the plant. The initial condition of bunchgrasses within the site along with seasonality and intensity of the fire all factor into the individual species response. For most forbs and grasses the growing points are located at or below the soil surface providing relative protection from disturbances which decrease above ground biomass, such as grazing or fire. Thus, fire mortality is more correlated to duration and intensity of heat which is related to culm density, culm-leaf morphology, size of plant and abundance of old growth (Wright 1971, Young 1983).

Spike fescue - the dominant grass on this site - is a broad-leaf grass and is relatively tolerant of fire (Cook et al. 1994); the rhizomatous, dense growth of spike fescue may lessen the impact of fire on this species. Spike fescue persists following fire via on-site surviving rhizomes, and can colonize an area through off-site seed sources.It will reestablish by windblown seed from off- site seed sources (Bradley et al. 1992).

Idaho fescue grows in a dense, fine-leaved tuft. Fires tend to burn within the accumulated fine leaves at the base of the plant and may produce temperatures sufficient to kill some of the root crown. Mature Idaho fescue plants are commonly reported to be severely damaged by fire in all seasons. Sedge is top-killed by fire, with rhizomes protected by insulating soil.

The rhizomes of sedge species may be killed by high-severity fires that remove most of the soil organic layer. Reestablishment after fire occurs by seed establishment and/or rhizomatous spread.

Mountain brome, a minor component of this site, is a robust, coarse-stemmed, short lived perennial bunchgrass that can grow from 1 to 5 feet in height (Dayton 1937, Tilley et al. 2004). Mountain brome significantly decreases after burning (Nimir and Payne 1978). Mountain brome is likely to be top-killed by fire, although the coarse stems and broad leaves may be more fire-resistant than fine-leaved bunchgrasses. Mountain brome is most susceptible to fire damage when it is actively growing in spring and early summer. It is commonly seeded after wildfires due to its ability to establish quickly and reduce erosion (Tilley et al. 2004).

The effects of fire on slender wheatgrass, a broad-leafed grass, are dependent on its growth form. Tall, decadent plants with many leaves sustain the most fire damage, while those with short, sparse growth form are least likely to sustain damage to the root system during a fire. This makes the species relatively tolerant to fire (Blaisdell 1953, Wright and Klemnedson 1965). In a study by Nimir and Payne (1978), slender wheatgrass showed a significant increase after a spring burn on the Gallatin National Forest in Montana. Slender wheatgrass also showed an increase after burning in northwestern Wyoming (Wright and Bailey 1982).

Sandberg bluegrass (*Poa secunda*), a minor component of this ecological site, has been found to increase following fire likely due to its low stature and productivity (Daubenmire 1975). Sandberg bluegrass may retard reestablishment of deeper rooted bunchgrasses.

State and transition model

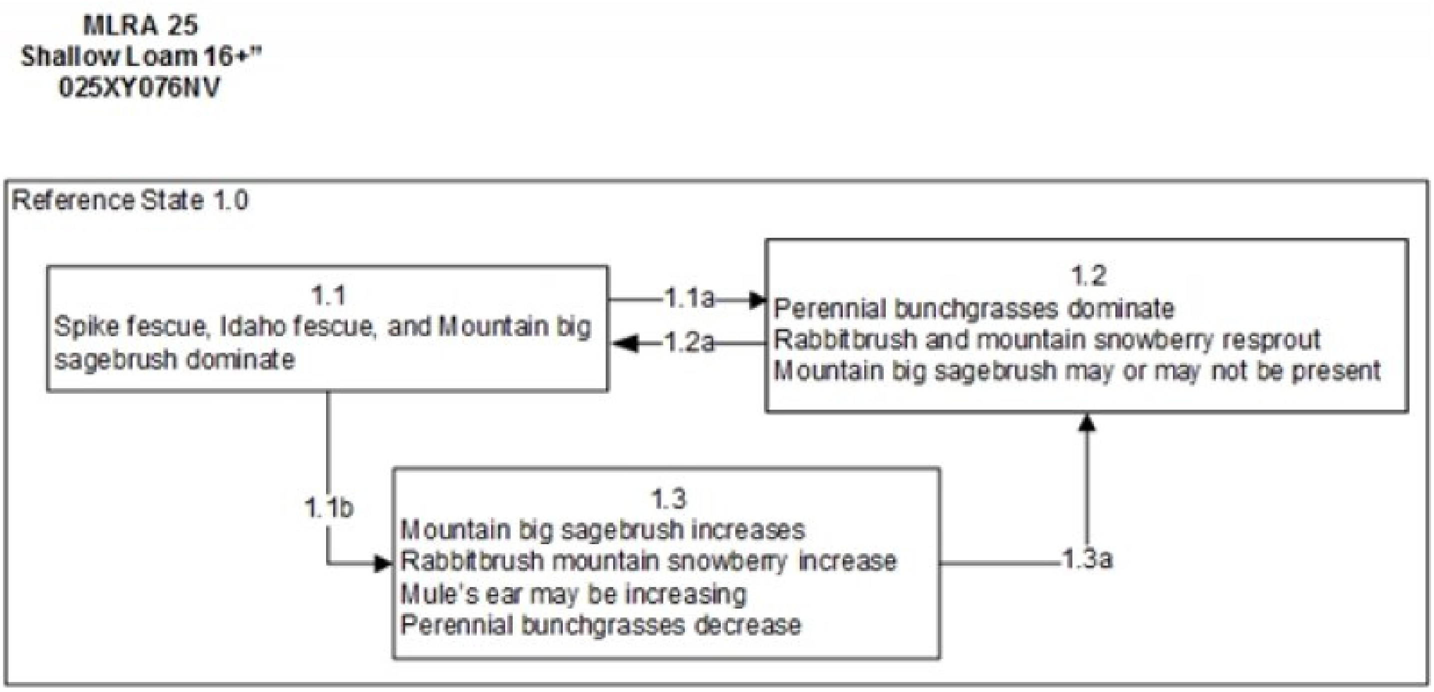

Figure 5. T Stringham 4/2014

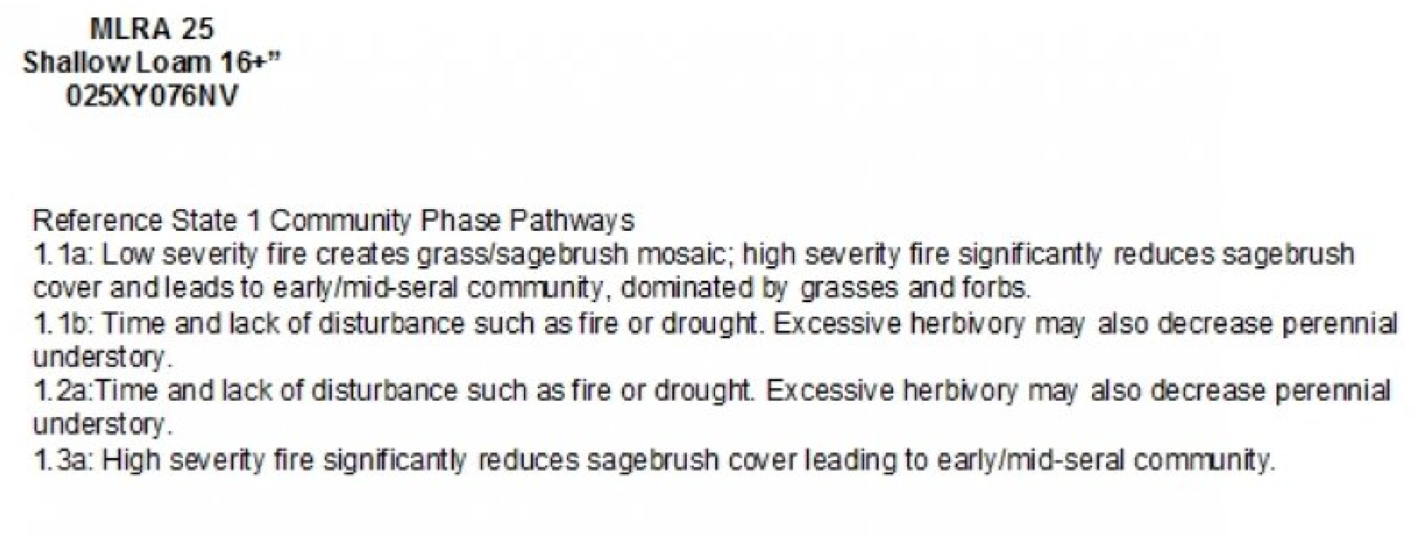

Figure 6. Legend

State 1
Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has three general community phases: a shrub-grass-dominant phase, a perennial grass-dominant phase and a shrub-dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Community 1.1
Community Phase

The reference plant community is dominated by spike-fescue, sedges, and mountain big sagebrush. Potential vegetative composition is about 55% grasses, 10% forbs and 35% shrubs. Approximate ground cover (basal and crown) is 45 to 55 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	247	432	616
Shrub/Vine	157	275	392
Forb	45	78	112
Total	**449**	**785**	**1120**

Community 1.2
Community Phase

This community phase is characteristic of a post-disturbance, early to mid-seral community phase. Perennial bunchgrasses, such as spike-fescue, Idaho fescue, mountain brome and sedges dominate. Sagebrush is killed by fire and may be a minor component and present in unburned patches. Mountain snowberry and rabbitbrush may be sprouting. Forbs may increase post-fire but will likely return to pre-burn levels within a few years. Bluegrass is stable within the community.

Community 1.3
Community Phase

Mountain big sagebrush and other woody shrubs increase in the absence of disturbance. Singleleaf pinyon may be present. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs or from grazing management. Sandberg bluegrass will likely increase in the understory and may be the dominant grass on the site. Balsamroot and other perennial forbs may also increase on the site.

Pathway a
Community 1.1 to 1.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring may be more severe and reduce sagebrush cover to trace amounts.

Pathway b
Community 1.1 to 1.3

Time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Long-term drought, herbivory, or combinations of these would cause a decline in perennial bunchgrasses and fine fuels leading to a reduced fire frequency allowing big sagebrush to dominate the site.

Pathway a
Community 1.2 to 1.1

Time and lack of disturbance over time allows for the sagebrush and other woody shrubs to recover and increase in size and density.

Pathway a
Community 1.3 to 1.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fine fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			243–494	
	spike fescue	LEKI2	*Leucopoa kingii*	157–235	–
	Idaho fescue	FEID	*Festuca idahoensis*	39–118	–
	sedge	CAREX	*Carex*	16–63	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	16–39	–
	mountain brome	BRMA4	*Bromus marginatus*	16–39	–
2	**Secondary Perennial Grasses**			16–78	
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	4–24	–
	big squirreltail	ELMU3	*Elymus multisetus*	4–24	–
	basin wildrye	LECI4	*Leymus cinereus*	4–24	–
	bluegrass	POA	*Poa*	4–24	–
Forb					
3	**Perennial Forbs**			39–118	
	basin wildrye	LECI4	*Leymus cinereus*	4–24	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	4–24	–
	lupine	LUPIN	*Lupinus*	4–24	–
	phlox	PHLOX	*Phlox*	4–24	–
Shrub/Vine					
4	**Primary Shrubs**			133–235	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	118–196	–
	sedge	CAREX	*Carex*	16–63	–
	buckwheat	ERIOG	*Eriogonum*	16–39	–
5	**Secondary Shrubs**			16–63	
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	4–24	–
	lupine	LUPIN	*Lupinus*	4–24	–
	phlox	PHLOX	*Phlox*	4–24	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–16	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	8–16	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Considerations for grazing management include timing, intensity and duration of grazing. Grazing management should be keyed to perennial grass production.

Overgrazing leads to an increase in sagebrush and a decline in understory plants. Squirreltail or Sandberg bluegrass will increase temporarily with further degradation. Invasion of annual weedy forbs and cheatgrass could occur with further grazing degradation, leading to a decline in squirreltail and bluegrass and an increase in bare ground. A combination of overgrazing and prolonged drought leads to soil erosion, increased bare ground, and a loss in plant production. Wildlife in sites with cheatgrass present could transition to cheatgrass-dominated communities, and without management, cheatgrass and annual forbs are likely to dominate.

Sandberg bluegrass increases under grazing pressure (Tisdale and Hironaka 1981) and is capable of co-existing with cheatgrass (*Bromus tectorum*). Excessive sheep grazing favors Sandberg bluegrass; however, where cattle are the dominant grazers, cheatgrass often dominates (Daubenmire 1970). Thus, depending on the season of use, the grazer and site conditions, either Sandberg bluegrass or cheatgrass may become the dominant understory with inappropriate grazing management.

Mountain big sagebrush is eaten by domestic livestock but has long been considered to be of low palatability, and a competitor to more desirable species.

Spike fescue (Leucopoa kingii) is a highly nutritious, productive and palatable grass. It is known to decrease under heavy grazing by livestock (Houston et al. 2001).

Mountain brome furnishes an abundance on herbage that remains palatable and nutritious through the growing season. New plants are established from seed and grazing practices should allow for ample seed production and establishment. This species is ranked as excellent forage for both cattle and horses and good for domestic sheep, though domestic animals will graze mountain brome only when it is fairly succulent. Mountain brome increases with grazing (Leege et al. 1981). A study by Mueggler (1967) found that with clipping, mountain brome increased in herbage production when clipped in June. When clipped in July, mountain brome increased due to reduced competition from forb species. The study also found that after three successive years of clipping, mountain brome started to exhibit adverse effects. Mountain brome is ranked as highly valuable as elk winter forage (Kufeld 1973).

Slender wheatgrass is a perennial bunchgrass that tends to be short-lived, though it spreads well by natural reseeding (Monsen et al. 2004). It is widely used in restoration seedings and is grazed by all classes of livestock (Monsen et al 2004). Slender wheatgrass tends to persist longer than other perennial grasses when subjected to heavy grazing (Monsen et al. 1996, Monsen et al. 2004).

Idaho fescue provides important forage for many types of domestic livestock. The foliage cures well and is preferred by livestock in the late fall and winter. Idaho fescue tolerates light to moderate grazing (Ganskopp and Bedell 1980) and is moderately resistant to trampling (Cole 1987). Heavy grazing may lead to replacement of Idaho fescue with non-native species such as cheatgrass (Mueggler 1984).

Snowberry is readily eaten by all classes of livestock, particularly domestic sheep. It is frequently one of the first species to leaf out, making it a highly sought after food in the early spring.

Chokecherry is moderately palatable to all classes of livestock, although it is more heavily browsed by domestic sheep than by cattle. Because of its toxicity, poisoning sometimes occurs. Livestock normally do not eat fatal quantities except when other forage is scarce.

Serviceberry branches and leaves are consumed domestic livestock, particularly in late winter and early spring. Serviceberry can tolerate moderate to heaving browsing when adequate precipitation is received.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine-tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
Idaho fescue is an important source of forage for pronghorn and deer in ranges of northern Nevada.

Mountain brome seedheads and seeds provide food for many birds and small mammals. Pronghorn antelope will consume mountain brome primarily in the spring. The palatability of mountain brome is excellent for deer, particularly during the late spring and early summer.

Slender wheatgrass is grazed by sage grouse, deer, elk, moose, bighorn sheep, mountain goat, pronghorn, and various rodents. The seeds are eaten by various seed predators. Slender wheatgrass provides hiding and thermal cover for songbirds, upland game birds, waterfowl, and small mammals.

Mountain big sagebrush is a highly preferred winter forage for mule deer, however; in a study by Personius et al. (1987), mountain big sagebrush was the most preferred sagebrush species. Fecal samples from ungulates in

Montana showed that bighorn sheep, mule deer, and elk all consumed mountain big sagebrush in small amounts in winter, while cattle showed no sign of sagebrush use. Reliance on the big sagebrush ecosystem by many wild animals for both food and cover has been documented and reviewed extensively. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Sage-grouse prefer mountain big sagebrush and Wyoming big sagebrush communities to basin big sagebrush communities.

Other shrubs on these sites that provide valuable forage for wildlife include serviceberry, mountain snowberry and chokecherry. Chokecherry provides important cover and habitat for wildlife. Utah serviceberry is considered a staple browse for deer and livestock, while the fruits are preferred by birds and small mammals (Conrad 1987). Birds also utilize the shrub for nesting and cover. Utah serviceberry also constituted two percent of the stomach contents of a big horn ram taken out of Clark County in 1952 (Guillion 1964). Black chokecherry is preferred browse by game species such as mule deer, birds and small mammals which consume both fruits and leaves (Plummer et al. 1968) sometimes to the exclusion of other forages (Gullion 1964).

Hydrological functions

Runoff is high. Permeability is moderately rapid. Hydrologic soil group is C.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

Native peoples used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing.

Other information

Mountain brome is an excellent native bunchgrass for seeding alone or in mixtures in disturbed areas, including depleted rangelands, burned areas, roadways, mined lands, and degraded riparian zones. Slender wheatgrass is widely used for revegetating disturbed lands. Slender wheatgrass is a short-lived perennial with good seedling vigor. It germinates and establishes quickly when seeded making it a good choice for quick cover on disturbed sites. It persists long enough for other, slower developing species to establish. It is especially valuable for use in saline soils. It has been used for rehabilitating mine spoils, livestock ranges, and wildlife habitat and watershed areas.

Inventory data references

Soils and Physiographic features were gathered from NASIS.

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T45 N R57 E S24
General legal description	in the northwest corner of the section on a southwest 55% slope that is 600 feet long.

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Contributors

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Approval

Kendra Moseley, 4/25/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	08/17/2024
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not**

invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. **Perennial plant reproductive capability:**